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I used this method a part of last year with medical students and their own testimony was that they were able to get a clearer idea in fifteen minutes as to what was meant by caloric feeding by being able to visualize the articles, than they were by reading pages and pages of tabulations showing that so many grams of one thing equaled so many calories, and so many grams of something else equaled so many more calories. I intend to use the method this winter with dispensary patients to find out, in the first place, approximately how much food they are getting. It has been our experience that many of the patients who come to Phipps Institute are getting food which amounts to but 1,200, 1,500 or 1,800 calories when their disease demands that they should be getting about twice that amount; and quite as often as not you will find that their deficient dietary is not a result of the fact that they have not money enough to get the food, but because they are not purchasing the right kinds of food.

Whether a better method than this one can be devised for the teaching of dietetics among people who have no knowledge whatever of food values, I do not know. I do know this, that prior to my seeing this exhibit, I had a very poor idea as to what my daily food consumption was. I had not the slightest idea whether I was getting 1,500 or 3,000 calories, but with this method I can compute it with a fair degree of accuracy.

A GUIDE TO THE NATION'S DIETARY NEEDS

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There are many popular theories current regarding the food habits and customs of different nations and regions and even more theories as to how those habits and customs might be changed to the benefit of mankind, but to a large extent these are based on inadequate observation, often merely on personal impressions, or even on the somewhat prejudiced opinions of the food faddist or the commercial exploiter. Evidently if we are to say with anything like accuracy how the nation can best be fed, we must have more definite

information as to what it needs and what it habitually uses. We are far from knowing as much as we should on either of these points, but the work of physiologists, chemists and statisticians taken together has done much toward starting us toward a real understanding of dietary needs.

During the last fifty years, our knowledge of human nutrition has developed into a well-ordered science, and as the combined result of clinical study, laboratory investigation and accurate observation of the diets normally chosen by persons living under different conditions, students of nutrition are now fairly well agreed as to the general food requirements of normal men, women and children. Our knowledge is rapidly increasing regarding the part played in the body by the different mineral matters, different types of protein, and the little known but apparently important growth-determining and body-regulating substances and as a consequence our ideas as to the special values of different kinds of food are slowly changing.

But while doctors still disagree as to the exact number of grams of protein a man should consume a day to build and repair his body tissues or exactly how we should reckon the calories of energy needed by the various members of a family, the great majority are now willing to adopt as a working hypothesis a daily requirement of from ninety to one hundred grams of protein for a one hundred and fifty-pound man at full vigor, with 3,000 calories of energy if he does a moderate amount of muscular work. Certain factors are also generally accepted by means of which this standard can be changed to express the requirements of persons of different age, sex and muscular activities. The energy requirements of a man at severe muscular work, for example, are reckoned as two-tenths greater than that of one at moderate muscular work, and that of a woman as eight-tenths of that of a man of corresponding muscular activity. In the light of our present limited knowledge of the rôles played by different food constituents, it is generally considered safest to obtain the required protein and energy from a mixed diet in which the protein foods (*i.e.* meats, fish, dairy products, eggs, dried legumes, etc.), cereals, fruits and vegetables all appear with enough fats and sugars to render the diet palatable.

Exactly how much of each type of food should be included daily or even weekly, few would care to say. In practical menu making,

this is usually decided by the amount of money one has to spend on food; but the food groups should all appear reasonably often, and milk should always be provided for the use of children. Such a diet seems to correspond with the food habits most common in this country. Among the very poor, especially in large cities and in seasons of high prices, the total amount of food used is probably dangerously inadequate; and among special groups of our population, for instance in certain mountain regions of the southeastern states, there is evidence that the variety of food materials used is too restricted for safety; but taking the country over, we probably err on the side of abundance rather than scarcity. At any rate this is the condition shown by accurate studies of family dietaries that have hitherto been made in different sections of the country.

If we accept the standard quoted as a safe measure of food requirements, it should be a simple matter to calculate the food requirements of the nation. The census reports give the number of men, women and children of different ages and a fairly good indication of their occupations and probable muscular activity. Applying the factors previously referred to with these figures we could work out the total annual protein and energy requirements of the nation and the average requirements per capita per day. Going a step further, it would seem an equally simple matter to compare this theoretical national requirement with the total food consumed, and to tell at once how we could safely change our food consumption in a time of food shortage or national emergency. This is exactly what was attempted in Germany by the so-called Eltzbacher Commission and in England both by Thompson and by the Committee of the Royal Society in their reports on the Food Supply of the United Kingdom. It may be interesting to note in passing that both British reports used the American dietary factors and tables of composition of food materials originally worked out by Atwater and his associates and slightly revised by his successor, Langworthy, in the United States Department of Agriculture publications—a pleasant instance of the help American science has given to our allies.

Unfortunately, such calculations are open to two objections, which the practical experience of the foreign food control authorities has found to be well-founded. First, there are no figures from which the total food consumption can be calculated with any certainty of

correctness; and second, assuming the totals to be correct, they give no adequate idea of regional, racial or occupational variations in food habits.

In the foreign reports, the food consumption figures were obtained from agricultural and trade records of production, export and import, and if it were desirable, the same thing could be done in this country, in fact has often been done for such staples as wheat, beef, pork, etc. Unfortunately, when we try to do this for all the materials used for human foods, we find our records incomplete and conflicting. Nobody knows, for example, how much of the total corn crop is used for cattle feeding, how much in industry, and how much for human food. The census may show how many farmers keep hens, but would anyone care to estimate how many eggs are used in the average farm home or how many chickens end their careers on the farm table? Even supposing that we could estimate the total amount of vegetables and fruits raised in this country, could anyone say how much was wasted or spoiled before it reached the table? Even such an important and well-organized business as the dairy industry can give us no definite information as to the milk consumption of the United States. The census enumerators may take careful note of every cow in the country, but the most experienced dairyman can do no more than guess how much milk is used on the farms where it is produced, and not even he can say how much is fed to the stock, how much goes into butter for home use, and how much is consumed as such by the family. The most reliable estimate gives seven-tenths of a pint per day as the probable per capita consumption of milk, exclusive of butter and cheese, but this is admittedly based on nothing better than intelligent guesswork.

So far it has not seemed worth while to estimate the total food consumption of the United States by such a method. For the present, at least, the plan is to try another method, namely, that of the food survey authorized by a recent act of Congress and begun by the Department of Agriculture on August 31. As the newspapers have said, on that date investigators enumerated all the stocks of food materials then existing in wholesale warehouses and storage plants, in the stores of commission and retail merchants and small producers, and in the hands of hotels and restaurants, etc. In addition to this survey of commercial stocks, 3,500 typical families

selected from all over the country were visited and record made of all the food materials found in their pantries, storerooms and bins. From these an estimate is to be made of the total household stocks of the country—an unsatisfactory method, but the best compromise which could be found between leaving them out entirely and attempting to get figures from all of the 20,000,000 families in the country. The material represented by household stocks makes such a small proportion of the total material recorded, that any error that may creep in here is not serious. The results of this first survey of August 31 cannot fail to give valuable information as to what food materials the country possessed and where they were located; but those responsible for it consider it chiefly useful as testing out the machinery for the second survey which is planned to be made in November or December by improved methods. From the results of the two together they are confident that the annual food supply of the nation can be calculated more accurately than by the method used abroad.

If the food survey stopped there, we should still be faced by a lack of knowledge regarding variations in food customs. This is of great importance because men are more conservative in their food habits than in almost any other, and they will not submit to sudden changes except under the pressure of stern necessity. Everybody knows the stories of famines in Asia where rice-eating peoples have died rather than eat the unfamiliar wheat and barley which the government imported for them. The so-called food riots in some of our own cities last winter took place not because there was a general food shortage, but where certain staples (potatoes, onions, and chicken-fat in many cases) to which the people were accustomed had suddenly gone up in price. It is a first principle of enforced rationing that food prejudices are to be considered as far as possible. When a rich, food-producing nation is being asked voluntarily to share its abundance with distant allies, it is even more necessary for the leaders to know to what food it has been accustomed, and to consider these customs in suggesting changes. In a country which has a great variety of climate, agriculture, industry and racial stocks, there is an equal variety of dietary habits, and some way must be found of learning where and what they are.

The unprecedented value of the food survey as a guide to the nation's dietary needs lies in the fact that in addition to measuring

the nation's stock of food, it has planned to provide reliable information as to what people actually eat in different parts of the country and in families of different circumstances.

This is to be accomplished in two ways. The first is called a food consumption survey, and the preliminary survey was made with the coöperation of the 3,500 housekeepers visited for the household stock records. Each was asked to keep a daily record of the food used by her family for seven days. Blanks were provided on which all the common food materials were listed in a way which she could understand, and she was simply asked to put down the amount of each in the space provided. If purchased, the cost was also recorded; if home produced, this fact was noted and current retail prices were supplied by the investigator who distributed and collected the blanks. Entries were also made of the age, sex and occupation of the members of the household, their guests and the number of meals eaten by each. As much information as possible was collected regarding the health, racial stock, income and general economic condition of the family; the latter might be designated by number rather than name, and thus be identified only by the investigator.

The preliminary survey was necessarily so hastily organized that it was impossible to include as many of these consumption records as were desired or to distribute them as carefully as was wished in relation to rural and urban population, industrial and agricultural conditions, nationality and so on. Fifteen states were represented, chosen with reference to their general known dietary conditions. City and rural studies were included, the families representing various nationalities and incomes ranging from \$450 to \$7,500. In the second survey it is hoped to have at least 10,000 records with all the states represented and to apportion the families with due reference to urban and rural population, racial stocks, occupations and so on. Even so, the results will not be relied on to indicate accurately how much protein and energy is used per man per day, but rather to give a rough sketch of what the people in the different sections commonly eat. If the study does no more than indicate about how much milk the families use, especially how much goes to the children under seven, it will have been worth making. Even the preliminary survey, inaccurate and incomplete as it is, will tell us more than we have ever known about our national food habits.

For more accurate information as to the kind and amounts of food consumed, another type of records has been provided. These are known as dietary studies; the method of making them has been in use for forty or fifty years, and any intelligent senior in a college course in home economics should be able to conduct one. All the food on hand at the beginning of the study, all that procured during its course, and all remaining at the end, is carefully weighed and recorded. All waste and refuse are also noted. From these the amount of each food material actually used is determined. The percentage composition of each is then obtained from standard tables, or in rare cases, specially found by analysis, and by the use of these figures the protein, fats, carbohydrates and energy provided are easily calculated. In these dietary studies accurate note is made of the age, sex, weight, general condition and occupation of the different members of the family by means of which the nutrients and energy actually consumed per person or per man per day are calculated. As full information as possible is also obtained regarding the income, health and general standards of living. The duration of such a dietary study varies from two or three days to several weeks; those included in the food survey are for one week. If studies can be made in the same family at different times of the year the difference which seasons make in the diet is also shown: a condition met, in part at least, by the preliminary and final surveys which will represent late summer and early winter diets, that is, the season in which fresh fruits and vegetables are most abundant and that in which those materials are available mainly in conserved forms.

In the preliminary survey it was not feasible to have the dietary studies made through the same agencies as the food consumption studies, but the voluntary coöperation of suitable institutions and individuals was asked. Blanks and carefully worded instructions were sent out by means of which the task of collecting the desired data was made as simple as possible. All the state agricultural colleges and nearly all the privately endowed colleges having departments in home economics were appealed to and also a selected list of normal schools and other institutions, numbering about 390 in all. These are scattered throughout the forty-eight states, the largest numbers of studies being requested where population is densest.

These institutions were requested to distribute the blanks among their students or graduates in home economics, who in turn were asked to fill them in with data from well selected families. As far as possible these families were chosen with reference to typical variations in region, industrial condition, racial stocks, etc. In addition to the 1,800 studies thus obtained, about 700 blanks were filled out by selected individuals (mainly members of the American Home Economics Association) either in their own homes or in those of families whose coöperation they secured.

In gaining the consent of a family to have such a study made, the national importance of such information was explained and their help was represented as a real patriotic service. The investigator conducting the study usually found it advisable to pay a daily visit in addition to those at the beginning and end of the study, and was expected to fill in the blanks herself. All the calculations are to be made at the Department of Agriculture at Washington by the trained computers for the food survey. It is of course still too early to say how successful this method of collecting dietary studies will prove but the indications are that there will be reliable studies from nearly all the states. In the final survey it is hoped to repeat the studies in enough of the families represented in the preliminary one to give a just idea of seasonal variations in diet, and to include others which will fill in the gap left in the first. If, in addition to these studies, the Food Administration carries out its proposed plan of making similar studies in hotels, restaurants and clubs where large numbers of persons are fed and if we can compile with these the results of such work as the dietary studies made last spring by the United States Departments of Labor and Agriculture in connection with a cost of living survey in the District of Columbia and those conducted a few weeks since in connection with the food conservation work of the Massachusetts Council of National Defense, etc., we shall have a more complete picture of national food habits than has ever been attempted before.

It is true that the food supply this year is abnormal and that the picture thus presented may not show exactly what the nation habitually eats. This, however, will not destroy its present value as a dietary guide. If we learn that among certain groups there is evident under-nourishment we can more intelligently direct our efforts toward improving their supply because we will know wherein

the diet is deficient. If we find that the majority of children under three do not get the quart of milk per day which is believed necessary for their proper development, something must be done to increase the amount available for them, either by increasing the total amount of milk produced, or by lessening the amount used for making butter and cream or both.

If, in spite of high prices and general dislocation of the usual sources of supply, large sections of our population appear still to be eating more than the standard requirement, we shall be more than ever justified in urging them to curtail for the benefit of our allies. Moreover, we may find that in many, and perhaps in most sections of the country, our food habits have not yet been disturbed to any important extent.

Unfortunately we have no recent dietary studies on which to base such a comparison. Most of the statements now made regarding the diet of the United States as a whole are based on a compilation of 400 or more studies made under the auspices of the United States Department of Agriculture between 1890 and 1905. Incomplete as such a compilation seems in contrast to that undertaken by the food survey, it is a more accurate guide than is available in any country except Germany and possibly Belgium, and is fully as reliable as the data on which many accepted statements of the general cost of living are based. According to that compilation 38.5 per cent of the total food in the average American family is of animal origin, of which 16 per cent comes from meat (including lard) and poultry, 1.8 per cent from fish, 2.1 per cent from eggs, and 18.4 per cent from dairy products. Of the 61.5 per cent supplied by vegetable foods, 30.6 per cent comes from cereals, 24.7 per cent from fruits and vegetables and 5.4 per cent from sugar and miscellaneous materials. Judging by recent estimates of food consumption in 950 farm homes in fourteen states recently made by the Bureau of Farm Management¹ and by production and trade figures, the use of meat was decreasing during the years preceding 1915, and the use of fruits and vegetables was increasing, though to exactly what extent it is impossible to say. It seems likely that both these tendencies will be found to be intensified under present conditions. The increased

¹ U. S. Dept. Agricultural Bulletin 410. *Value to Farm Families of Food, Fuel, and Use of House*, by W. C. Funk. U. S. Dept. Agricultural Bulletin, 635. *What the Farm Contributes to the Farmer's Living*, by W. C. Funk.

use of fruits and vegetables is undoubtedly beneficial; and the decreased use of meats is not dangerous as long as small amounts are used occasionally and the total protein requirement is met by other protein-rich foods, including milk and its products.

It may be interesting to see how these 'older American dietary studies compare with the results of the German and British calculations alluded to before. Such a comparison cannot be accurate because the food materials are not uniformly grouped in the different compilations, and because the foreign studies represent gross consumption and make no allowance for waste, either in marketing or in the household, whereas the American ones refer to food actually consumed. The German figures² for per man per day consumption were 117.3 grams of protein and 4,164 calories of energy. Thompson's figures³ for Great Britain are 105 grams of protein and 4,190 calories of energy. Corresponding ones in the official English report⁴ are 113 grams of protein and 4,009 calories of energy per man per day. Thompson estimated the average waste between producer and consumer at 7.5 per cent. Assuming this to be correct for all three studies, the figures become, for the German report, 109 grams of protein and 3,852 calories of energy; for the Thompson report, 97 grams of protein and 3,875 calories of energy; and for the Board of Trade report, 105 grams of protein and 3,708 calories of energy. A rough average of the 400 American dietary studies indicates about 95 grams of protein and 3,500 calories of energy actually consumed per man per day.

In order to make these figures comparable with the foreign ones, allowance must be made for household waste. This has been found to run from nothing up to as high as 20 per cent, according to the carefulness of the housekeeper. The average is probably between 7.5 and 10 per cent. Assuming the latter figure to be correct, the per man per day consumption of food as purchased becomes 105

² *Die deutsche Volksernährung und der englische Aushungerungsplan*, Edited by Paul Eltzbacher, Brunswick, 1914, pp. vii, 196.

³ A calculation of the foodstuffs and energy of Great Britain's food supply, W. H. Thompson—*Communication to the Royal Dublin Society*, Oct. 26, 1915. Abridged under the title of *The Daily Food Ration of Great Britain*, *Nature* [London] 96 (1916), No. 2416, pp. 687-690.

⁴ *The Food Supply of the United Kingdom*. A report drawn up by a committee of the Royal Society at the request of the President of the Board of Trade, London.

grams of protein and 3,850 calories of energy per man per day. These figures probably underestimate the true average consumption because a larger proportion of the studies on which they are based were made among families lower in the economic scale than would be found in the total population. In fact unpublished estimates of rural diets based on the farm management studies already referred to, show 110 grams of protein and 3,964 calories of energy per man per day. This indicates that the average normal American diet is higher than the English in both protein and energy, equal to the German in protein and superior to it in energy. Its principal advantage over the European ones, however, lies in the fact that it includes a greater variety of food materials, notably of fruits and vegetables. This variety is probably one reason for its greater cost.

The many assumptions made in this rough comparison of our own and foreign food consumption furnish a good illustration of the guesswork used in all such estimates and emphasize again the need of such information as that provided by the dietary studies of the war emergency food survey. If we succeed in carrying these through successfully we may have developed machinery simple enough to be used whenever occasion requires. Indeed, some well-informed food economists hope that in the future such dietary surveys will become a recognized part of our statistical information and be made as regularly as cost of living studies are now. Be that as it may, the extensive series now begun ought to provide a reliable working guide for the present emergency, and an almost inexhaustible mine of general information for the student of nutrition in the United States.